A STUDY OF COMPARATIVE ANALYSIS OF VISUAL AND VERBAL CUE TRAINING ALONG WITH TACTILE STIMULI ON GAIT AND MOBILITY AMONG PARKINSON'S PATIENTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

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(ELECTIVE – PHYSIOTHERAPY IN NEUROLOGY)

To

The Tamil Nadu Dr. M.G.R. Medical University

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RVS COLLEGE OF PHYSIOTHERAPY

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CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

SUBMITTED IN THE PARTIAL FULFILLMENT OF THE REQUIREMENT

FOR DEGREE OF "MASTER OF PHYSIOTHERAPY"

TO

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY,

CHENNAI.

APRIL 2012

DECLARATION

I hereby declare and present my project work entitled "A STUDY OF COMPARATIVE ANALYSIS OF VISUAL AND VERBAL CUE TRAINING ALONG WITH TACTILE STIMULI ON GAIT AND MOBILITY AMONG PARKINSON'S PATIENTS" The outcome of the original research work undertaken and carried out by me, under the guidance of Professor Mrs.S.Seema, MPT. RVS College of Physiotherapy**,** Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the Tamil Nadu Dr. M.G.R Medical University.

SIGNATURE

ACKNOWLEDGEMENT

I magnify the LORD MY GOD, I will give thanks with my whole heart will tell of your wonderful deeds now and forever.

I humbly acknowledge all the love and care showered by the parents Mr. Sasi P.P & Mrs. Sujatha Sasi throughout my life in making me what I am.

My heartfelt thanks to The Chairman, Managing trustee and the Secretary of RVS Educational Trust, Sulur, Coimbatore, for providing me an opportunity to do this dissertation.

I wish to express my heartfelt gratitude and special thanks to my principal Mrs. R. Nagarani, M.P.T., Ph.D., R.V.S College of Physiotherapy .

I cover my heartfelt thanks to my guide Mrs.S.Seema, M.P.T., for this diligent effort to ensure the best quality of this piece of work. Her assertiveness and faith in my abilities as sustained my energies to complete this work successfully. And also thanks to Mr. Fraklin shaju for his help.

It is difficult to envision completing a project such as this without the help of many people I owe great deal of thanks to the many that made this reality by extending their helpful hands.

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I. INTRODUCTION

Parkinson's disease is a common, slowly progressive, neurodegenerative disease. It results from the degeneration of neurons in the substantia nigra, a region of the brain that controls movement. This degeneration results in a shortage of a neurotransmitter called dopamine, therefore, causing impaired movement. The disease is most frequently seen in people in their 70s and 80s

Parkinson's disease is named after James Parkinson (1755-1824), an English apothecary surgeon, paleontologist, geologist and political activist. In his most famous work An Essay on the Shaking Palsy, 1817, Public awareness campaigns include Parkinson's disease day (on the birthday of James Parkinson, April 11) and the use of a red tulip as the symbol of the disease.

Parkinson's disease is both chronic and progressive. Chronic means long-term, while progressive means it gradually gets worse.

Parkinsonism is a neurological syndrome characterized by tremor, rigidity, postural instability, and hypokinesia (decreased bodily movement). A syndrome is the association of several clinically recognizable features, signs, symptoms, phenomena or characteristics that often occur together. Parkinson's disease belongs to a group of conditions called movement disorders. Movement disorders describe a variety of abnormal body movements that have a neurological basis, and include such conditions as cerebral palsy, ataxia, and Tourette syndrome. Parkinson's disease results from decreased stimulation of the motor cortex by the basal ganglia, typically caused by insufficient formation and action of dopamine.

Parkinsonism, it is a neurologic syndrome usually resulting from deficiency of the neurotransmitter dopamine as the consequence of degenerative, vascular, or inflammatory changes in the basal ganglia; characterized by rhythmic muscular tremors, rigidity of movement, festination, droopy posture, and masklike faces.

Parkinson's disease causes problems with movement, cognition and neurobehavior, as well as sensory and sleep difficulties. The signs and symptoms usually begin gradually, slowly and often randomly

Each sufferer will be affected differently, with a unique set of symptoms. Patients also tend to respond differently to treatment. Symptom severity also varies enormously. Some patients may experience tremor (shaking) as their primary symptom, while others may not have tremors, but have balance problems. While the disease may develop slowly for some individuals, for others it progresses rapidly

The four main signs and symptoms include slow physical movements (bradykinesia), shaking (tremor), muscle stiffness (rigidity) and postural instability (impaired balance and coordination). They are called the primary motor symptoms:

Rehabilitation is a possible treatment for gait disorders in patients with Parkinson's disease. Many studies have shown the efficacy of rehabilitation at improving specific impairments and functional limitations in individuals with Parkinson's disease.

Fundamental to these gait deficits is the inability to produce a normalized step length. Sensory cueing strategies such as auditory,

tactile, and visual cues have often been used to help walking in Parkinson's disease.

The primary objective of this study was to investigate the efficacy visual and verbal cue training along with tactile stimuli on gait and mobility rehabilitation in Parkinson's disease.

Various scales were used to measure mobility in Parkinson's disease, which included Mobques 47, Himat, Functional mobility scale, Timed up and go test, Movement assessment battery for old age people. In present study we explained about "Timed up and go test".

Similarly, there are various measuring tool were used to measure gait in Parkinson's disease, which included step length, stride length, speed, cadence. In this study we used "Step length" to measure gait.

Physiotherapy treatment usually begins soon after the diagnosis is made. Physiotherapy programs use specific sets of exercises and activities to work towards two important goals, to maintain the muscle power, mobility and gait. Physiotherapy section includes muscle strength exercises that helps to maintain muscle tone and strength and improve mobility. Full range of motion exercises improves balance, walking, and strength.

The use of external cueing techniques to improve Parkinson's gait has received considerable attention recently. The present study is an attempt to compare the training effect of visual and verbal cue training along with tactile stimulation on improving gait and mobility.

1.1. Statement of problem

A study of comparative analysis of the effectiveness of visual and verbal cue training along with tactile stimuli on gait and mobility among Parkinson's disease patients.

1.2. Need of study

- It is to find out the effect of visual cue training and tactile stimuli on gait and mobility among Parkinson's patients.
- It is to find out the effect of verbal cue training and tactile stimuli on gait and mobility among Parkinson's patients.
- It is an attempt to compare the effectiveness of visual and verbal cue training along with tactile stimuli on gait and mobility among Parkinson's patients.

. 1.3. Hypothesis

1.3.1 Null Hypothesis:

There is no significant difference in the effectiveness of visual and verbal cue training along with tactile stimuli on gait and mobility among Parkinson's patients.

1.3.2 Alternate Hypothesis:

There is significant difference in the effectiveness of visual and verbal cue training along with tactile stimuli on gait and mobility among Parkinson's patients.

1.4 Operational definitions:

- **Parkinson's disease :**

Parkinsonism, it is a neurologic syndrome usually resulting from deficiency of the neurotransmitter dopamine as the consequence

of degenerative, vascular, or inflammatory changes in the basal ganglia; characterized by rhythmic muscular tremors, rigidity of movement, festination, droopy posture, and masklike faces.

- **Visual cue**

The visual cues are commonly transverse lines or rods on the floor (floor markers).Such cues have been shown to improve stride length and velocity in Parkinsonian gait by susbtituting kinaesthetic feedback with visual feedback for regulating movement amplitude.

- **Auditory cues**:

Auditory cues normally given to the patient verbally like “take long step” and guide to normal gait pattern.

- **Mobility**

Mobility is the ability to move or be moved freely and early.

- **Step length**

Step Length is the distance between the point of initial contact of one foot and the point of initial contact of the opposite foot. In normal gait, right and left step length are similar.

II. REVIEW OF LITERATURE

2.1. Section – A: Studies on effect of visual cue

1. **Quincy J. Almeida and Haseel Bhatt(1999)**

The results of the study reveal that a reduced amount of optic flow can produce similar benefits during gait training and clinically, the implementation of transverse lines as a long-term cueing therapy for Parkinson's disease seems appropriate. Furthermore, future work should focus on implementing visual cueing therapy during functional aspects of walking such as gait initiation, termination, and turning

2. **Azulay et al. (1998)**

Suggested that visual cue may draw attention to the stepping process if patients are talked to put their feet on the stripes or motion of floor stripes may enhance the optical flow

3. **Asuley (2001)**

Proved that visual cues serves as moving targets, activating the cerebellar-visual motor pathway

4. **Praamstra et al. (1999)**

States that initiation of movement in Parkinson's disease patients relies on a preliminary visual analysis.

5. Gywn N Lewis (1997)

Documented that marked improvements in the hypokinetic gait pattern of Parkinson's disease patients are possible with the use of appropriate visual cues. This project served to evaluate Parkinson's disease gait performance as well as residual processing capacity while using fixed or gait regulated visual cues. And suggested that ability to utilize visual feedback to regulate movement amplitude, reducing their reliance on kinesthetic feedback.

2.2. Section – B: Studies on verbal or auditory cue.

1. Lehman, David, Toole tonya (2005)

Proved that training with verbal instructional cues results in near term improvement of gait in people with Parkinson's disease. These data support the concepts that people with Parkinson disease have a potential for motor learning.

2. Lynn Rochester, David J Burn MB (FEB 2009)

The study proved that auditory rhythmical cueing improved gait in people with Parkinson's disease and cognitive impairment. The cue that focused attention on both temporal and spatial parameters of gait significantly improves single and dual task walking speed and stride amplitude. This study provides evidence for the potential of cueing to improve gait in Parkinson.

3. Miguel Fernandez del Olmo, Javier Cudeiro (2004 march)

Studies based on temporal variability of gait in Parkinson's disease. Proved the effectiveness of rhythmic sound cues in rehabilitation program

4. Lehman, .(2004)

Assessed and reported the immediate and near term effects of an instructional set on select gait parameters in people living with Parkinson's disease. The instructional set was effective in improving parameters of gait for at least 4 weeks. These data support the concept that people with parkinson's disease have a potential for motor learning.

5. Neurorehabilitation Neural Repair September 1, (2011)

Proved that step training and rhythmic auditory stimulation is effective treatment on functional performance in Parkinson patients.

6. Inge Lim,(2008)

Reported that auditory cueing training improve physical activity in patients with Parkinson's Disease

7. Mchael H Thaut , Colondo state university(2011)

Physiological research has shown that Auditory rhythm has a profound effect on the motor system., Parkinson's disease, traumatic brain injury, and other conditions. Results have been strong in favor of rhythmic auditory stimulation (RAS) to significantly improve gait and upper extremity function. Comparative studies also have shown RAS to be more effective than other sensory cues and other techniques in physical rehabilitation.

2.3. Section C: Studies on external auditory cues

1. Rochester L, Hetherington V. Jones D.(2009)

Reported that exeternal auditory cues may be useful in reducing interference and maintaining gait performance during more complicated functional activities. Clinical symptoms, such as depression and fatigue could influence the ability to focus attention and may increase gait interference during the performance of complex task, with subsequent implications for functional walking and safety.

2. M. Suteerawattananon(2007)

Concluded that combining visual and auditory cues has a greater effect on the gait pattern of patients with Parkinson's disease (PD) than the cues applied individually. Visual and auditory cues improved gait performance in patients with PD, but they did so in different ways. Auditory cueing significantly improved cadence, but visual cueing improved stride length.

2.4. Section D: Studies on gait analysis in Parkinson's disease

1. Zahra Kadviar, Daniel M Corcos, James Foto (1991)

Parkinson's patient can generalize motor improvements achieved during multidirectional step training to context of functional gait and balance. Training with rhythmical auditory cue is advantageous for enhancing functional gait improvement and maintenance of functional gait and balance improvements.

2. Weiner and coworkers (1996)

Showed that out of three subjects in stride length instruction group, one subject showed no change in cadence and two subjects showed progressive increase in cadence.

3. Meg E Morris et al3

Reported that Parkinson's disease patients have the ability to modulate cadence but not the step length and that the gait hypokinesia is due to inability to regulate step length.

2.5. Section E: Studies on measuring tools

1. Gyrd.Thrane, Ragner M Joakimsen, Eline Thornquist

They concluded that timed up and go test was the best measurement tool in measuring mobility. Results correlate with gait speed, balance, functional level,the ability to go out, and can follow change over time.

2. Sutherland, Olshen, Biden & Wyatt (1988)

Concluded that step length was the one of the measurement tool in measuring the gait in Parkinson's patients.

III METHODOLOGY

3.1. Study design:

The study design was a pre- test, post – test Experimental study

3.2. Study setting:

Sunrise Hospital, Ernakulam, Kerala.

3.3. Sample and Sampling method:

Ten subjects who fulfilled inclusion and exclusion criteria were selected. Out of them five were allotted in group A for visual cue training and tactile stimuli on gait and mobility among Parkinson's patients. Five were allotted in group B for verbal cue training and tactile stimuli on gait and mobility among Parkinson's patients.

3.4 Inclusion Criteria:

- Idiopathic Parkinson's disease
- Ability to walk without any physical assistance
- Visual and hearing capacity sufficient to perceive the cues
- Modified Hoehn and Yahr stage II – IV
- Walking independently for 12m distance and patient concern for deteriorating walking performance.
- Stable pharmacological treatment

3.5 Exclusion criteria:

- DBS or other stereotactic neurosurgery;
- Cognitive impairment (MMSE<24)
- Postural hypotension
- Disorders interfering with participation in cue training: visual impairment, hearing impairment, neurological, cardio-pulmonary or orthopaedic problem.

3.6. Study duration

Four months duration for 5 times per week

3.7. Variables

3.7.1 Dependent Variables:

- Gait
- Mobility

3.7.2 Independent Variables:

- Visual cue training
- Verbal cue training
- Tactile stimulation

3.8 Measuring tools:

- Step length
- Timed up and go test

3.9. Procedure:

Step-1: Pre test-All the participants regarding the dependent variables.

Step-II: Divide the subjects into two groups.

Step-III: Treatment interventions.

Step-IV: Post test-All the participants regarding the dependent variables.

Step Length

1. Measure off a given distance, in feet.

2. Mark both ends of the measured distance with masking tape.

3. Walk the given distance and count the number of steps.

4. Divide the distance by the number of steps.

Timed Up and Go (TUG) Test

1. Equipment: Arm chair, Tape measure, Tape, Stop watch.

2. Begin the test with the subject sitting correctly in a chair with arms, the subject's back should resting on the back of the chair. The chair should be stable and positioned such that it will not move when the subject moves from sitting to standing.

3. Place a piece of tape or other marker on the floor 3 meters away from the chair so that it is easily seen by the subject.

4. Instructions: “On the word *GO* you will stand up, walk to the line on the floor, turn around and walk back to the chair and sit down. Walk at your regular pace.

5. Start timing on the word “*GO*” and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair.

6. The subject wears their regular footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

7. Normal healthy elderly usually complete the task in ten seconds or less. Very frail or weak elderly with poor mobility may take 2 minutes or more.

8. The subject should be given a practice trial that is not timed before testing.

9. Results correlate with gait speed, balance, functional level,the ability to go out, and can follow change over time.

10. Interpretation < 10 seconds = normal

< 20 seconds = good mobility, can go out alone, mobile without a gait aid.

< 30 seconds = problems, cannot go outside alone, requires a gait aid.

A score of more than or equal to fourteen seconds has been shown to indicate high risk of falls.

Treatment Procedure:

Group A:

Group A consists of five subjects who received visual cue training and tactile stimuli on gait and mobility among Parkinson's patients.

Visual cues were provided on ground with the use of white lines. To standardize the step length required during training, we selected a separation between lines that was a minimum of 8% greater than the initial step length of any of the groups. Thus, based on previous research and also this 8% requirement, the white lines were separated by 70 cm. This ensured that from one consecutive heel strike to the next, participants in the over ground trained with an equivalent distance between cue steps. Over ground gait training required participants to walk down equally spaced transverse lines, presented on a 16-meter carpet. The cues were white lines of tape equally distributed at a standardized length on the black background carpet. Along with this visual cue training, tactile stimulation was given to the patient.

Group B:

Group B consist of five subjects who received verbal cue training and tactile stimuli on gait and mobility among Parkinson's patient.

Group B were instructed to walk with long steps. Command given was "take long steps" These instructions were given after every 2 walks and when necessary. Tactile stimulation was given to the patient along with the command

.

Subjects were free to rest at any time they wanted by sitting on chairs placed at the ends of 10 – m walkway. General flexibility and relaxation exercises were given to all patients as home exercises program.

IV DATA ANALYSIS AND RESULTS

4.1 DATA ANALYSIS

Paired ‘t’ test

The data’s collected were subjected to Paired ‘t’ test.

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \frac{\sqrt{\sum d^2 - \frac{\sum (d)^2}{n}}}{n-1}$$

Where

$\bar{d}$= calculate mean difference between Pre & Post test values

d= difference between Pre & Post test values

n=Sample size

S=standard deviation

Unpaired‘t’ test

The unpaired t’ test was used to compare the statistically significant difference of mobility and balance between group A and B subjects.

$$s = \sqrt{\frac{\sum(x_{1-}\ \bar{x}_2)^2+\sum(x_{2-}\ \bar{x}_2)^2}{n_1+n_2-2}}$$

$$T = \frac{\bar{x}_{1-}\ \bar{x}_2}{s} \quad \sqrt{\frac{n_1 n_2}{n_1+n_2}}$$

n_1 = Total number of subjects in group A

n_2= Total number of subjects in group B

x_1= Difference between pretest Vs post test value of group A

$\overline{x_1}$= mean value of difference between pre test Vs post test value of group A

x_2=Difference between pre test Vs post test value of group B

$\overline{x_2}$=Mean value of difference between pre test Vs post test value of group A

GROUP – A MOBILITY GRADE (TIMED UP AND GO TEST)

VISUAL CUE TRAINING AND TACTILE STIMULI ON GAIT AND MOBILITY

Table-1 shows the comparative mean value, mean difference, standard deviation &'t' value between pre and post test of Mobility in group A

S.NO	Mobility	Improvement		Standard Deviation	Paired 't' value
		Mean	Mean Difference		
1.	Pretest	18.8	4.4	2.302	4.273
2.	Post test	14.4			

In paired 't' test the calculated 't' value is 4.273 't' table value is 4.03 at 0.01 level. The above values show that there is a significant improvement in mobility among pre & post test values.

Fig:3 Graphical representation of mean score of mobility for group A

GROUP – B MOBILITY GRADE (TIMED UP AND GO TEST)

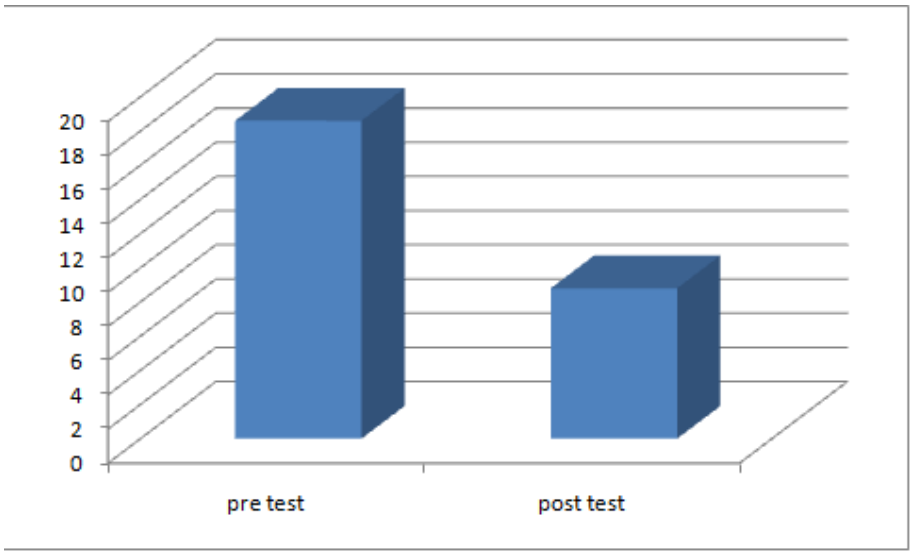
VERBAL CUE TRAINING AND TACTILE STIMULI ON GAIT AND MOBILITY

Table-2 shows the comparative mean value, mean difference, standard deviation &'t' value between pre and post test of Mobility in group B

S.NO	Mobility	Improvement		Standard Deviation	Paired 't' value
		Mean	Mean Difference		
1.	Pretest	18.6	9.8	2.863	7.6540
2.	Posttest	8.8			

In paired't' test the calculated 't' value is 7.6540 't' table value is 4.03 at 0.01 level. The above values show that there is a significant improvement in mobility among pre & post test values.

Fig: 4 Graphical representation of mean score of mobility for group B



COMPARATIVE MOBILITY GRADE

(TIMED UP AND GO TEST)

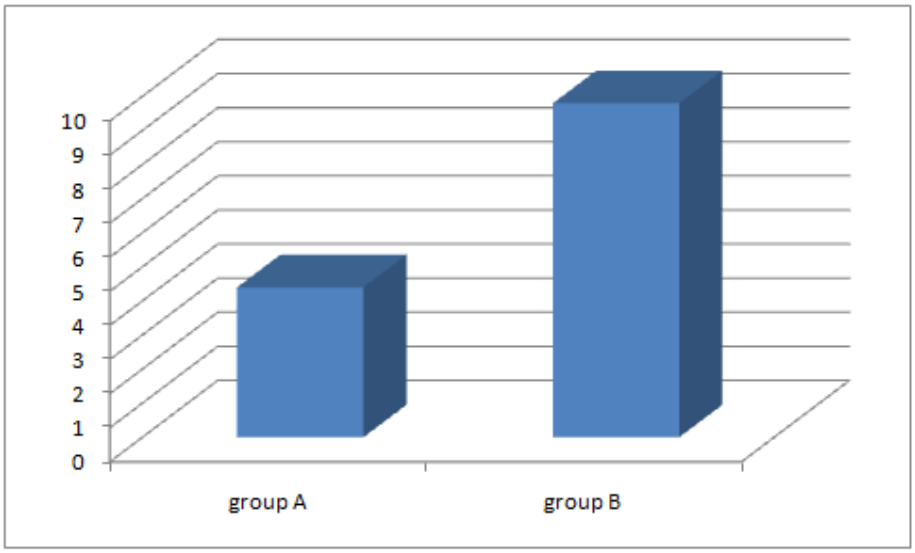
GROUP – A VS GROUP – B

Table-3 shows the comparative mean value, mean difference, standard deviation & un paired‘t’ value between pre and post test of Mobility in group A & B

S.NO	Mobility	Improvement		
		Mean Difference	Standard deviation	Un paired ‘t’ Value
1.	Group A	4.4	2.443	3.492
2.	Group B	9.8		

In unpaired ‘t’ test the calculated ‘t’ value is 3.492 ‘t’ table value is 3.17 at 0.01 level. The above values show that there is a significant improvement in mobility among & post test values group A and group B.

Fig: 5 Graphic representation of comparative mean score of mobility for group A and group B



GROUP A STEP LENGTH

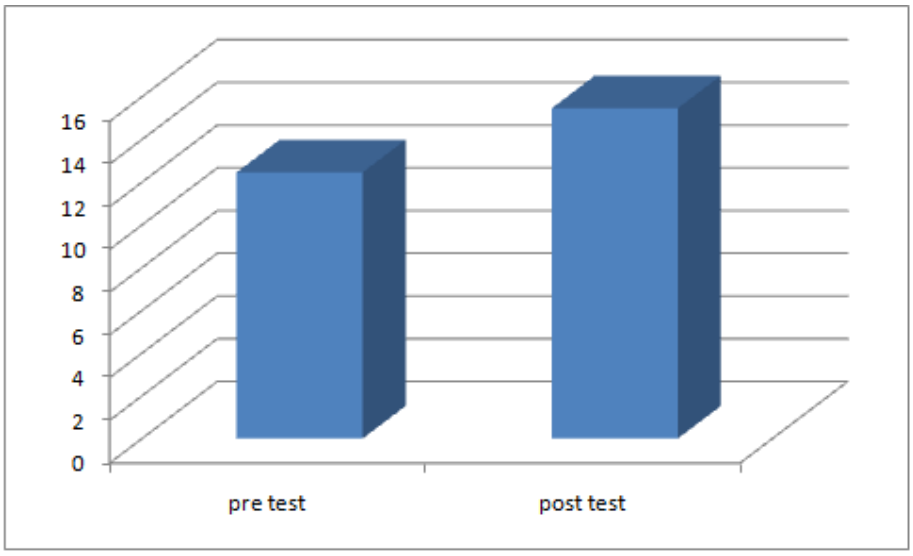
VISUAL CUE TRAINING AND TACTILE STIMULI ON GAIT AND MOBILITY

Table-4 shows the comparative mean value, mean difference, standard deviation & Paired 't' value between pre and post test of step length in group A

S.NO	Step length	Improvement		Standard Deviation	Paired 't' value
		Mean	Mean Difference		
1.	Pretest	12.46	3	0.94	7.136
2.	Posttest	15.46			

In paired't' test the calculated't' value is 7.136 't' table value is 4.03 at 0.01 level. The above values show that there is a significant improvement in mobility among pre & post test values

FIG: 6 Graphical representation of mean score of step length for group A



GROUP B STEP LENGTH

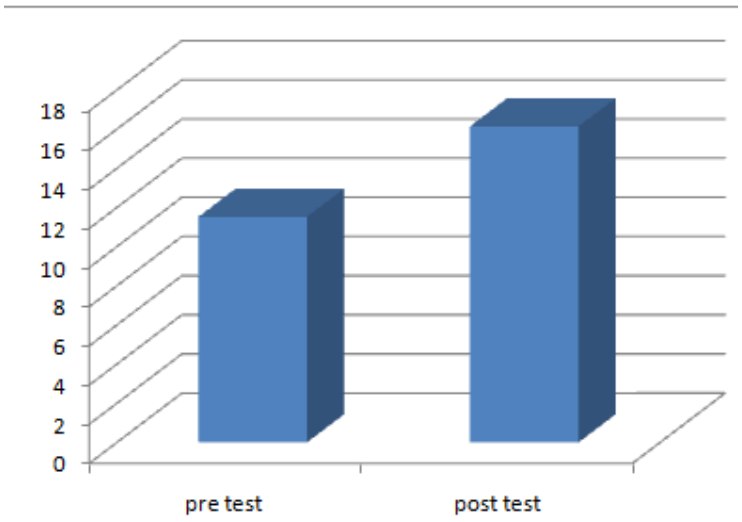
VERBAL CUE TRAINING AND TACTILE STIMULI ON GAIT AND MOBILITY

Table 5-shows the comparative mean value, mean difference, standard deviation &'t' value between pre and post test of step length in group B

S.NO	Variable Step length	Improvement		Standard Deviation	Paired 't' value
		Mean	Mean Difference		
1.	Pretest	11.52	4.62	0.552	19.78
2.	Posttest	16.14			

In paired 't' test the calculated 't' value is 19.78 't' table value is 4.03 at 0.01 level. The above values show that there is a significant improvement in mobility among pre & post test values

FIG: 5 Graphical representation of mean score of step length for group B



COMPARATIVE STEP LENGTH

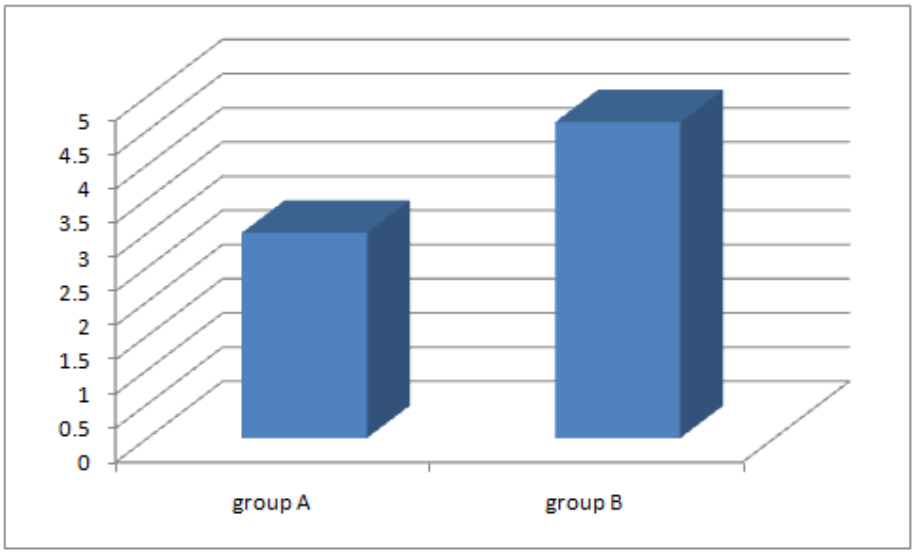
GROUP – A VS GROUP – B

Table-6 shows the comparative mean value, mean difference, standard deviation & un paired‘t’ value between pre and post test of Step Length in group A & B

S.NO	Step length	Improvement		
		Mean Difference	Standard deviation	Un paired ‘t’ Value
1.	Group A	3	0.5831	4.389
2.	Group B	4.62		

In unpaired ‘t’ test the calculated‘t’ value is 4.389 ‘t’ table value is 3.17 at 0.01 level. The above values show that there is a significant improvement in mobility among pre & post test values group A and group B.

FIG: 6 Graphic representations of comparative mean score of step length for group A and group B



4.2. Results

The number of subjects for the study were 10 (n=10). The subjects were dived in to two groups A and B. For group A visual cue training and tactile stimuli on gait and mobility. For group B verbal cue training and tactile stimuli on gait and mobility among Parkinson's disease was given.

The patients were treated per session a day like that for four weeks. Before starting treatment mobility was graded by timed up and go test and gait was graded by step length in cm. The measurements were repeated after four weeks.

The mean values of timed up and go test, pre test scores of group A was 18.8 and group B was 18.6. The mean values of timed up and go test, post test scores of group A 14.4 and group B 8.8. The mean values of step length the pre test scores of group A was 12.46 and group B was 11.52. The mean values of step length, the post test scores of group A was 15.46 and group B was 16.14.

Regarding the dependent variable mobility and step length in Group-A, the calculated paired 't' value is 4.273 and 7.136 respectively at 0.01 level. The 't' table value is 4.03 at 0.01 level. Hence the calculated 't' value is more than 't' table value. The above value shows that there is significant difference in mobility and step length following visual cue training and tactile stimuli on gait and mobility among Parkinson's patients. In Group-B, the calculated 't' value for mobility and step length is 7.6540 and 19.78 respectively at 0.01 level. The 't' table value is 4.03 at 0.01 level. Hence the calculated 't' value is more than 't' table value. The above value shows that there is significant

difference in mobility and step length following visual cue training and tactile stimuli on gait and mobility among Parkinson's patients.

When analyzing Group 'A' and Group 'B' by unpaired 't' test, the calculated t' value for mobility and step length is 3.492 and 4.389 respectively, the table 't' value is 3.17 at 0.01 level. Hence the calculated 't' value is more than 't' table value. The above value shows that, there is significant difference between visual cue and verbal cue training along with tactile stimuli on improving gait and mobility among Parkinson's patient. Hence we accept Alternate hypothesis and reject null hypothesis.

V. DISCUSSION

The study was an experimental study, conducted to assess the effectiveness of visual and verbal cue training along with tactile stimulation on gait and mobility among Parkinson's patients. Totally ten patients were participated in the clinical trial. The present study demonstrates that there is significant difference in effectiveness in visual and verbal cue training along with tactile stimulation on gait and mobility in group A and group B.

The group A was given visual cue training and tactile stimuli on gait and mobility. The group B was given verbal cue training and tactile stimuli on gait and mobility. Both groups selected in this study were assessed on the first day prior to the treatment and the last day of fourth week. Tools taken for measuring the outcome of mobility were timed up and go test and step length was used for measuring the outcome of gait.

Gyrd.Thane et.al concluded that timed up and go test was the best measurement tool in measuring mobility in Parkinson's disease. So the present study included "TIMED UP AND GO TEST" for measuring mobility.

Sutherland, Olshen, Biden & Wyatt (1988) concluded that step length was the one of the measurement tool in measuring the gait in Parkinson's patients. So present study included "step length" for measuring gait.

Gywn N. Lewis study suggests the ability to utilize visual feedback to regulate movement amplitude, reducing their reliance on kinesthetic feedback.

Azulay et al suggested that visual cue may draw attention to the stepping process if patient are talked to put their feet on the stripes or motion of floor stripes may enhance the optical flow.

Verbal cue also significantly improves gait speed (more than visual cue) by increase in step and stride length as well as cadence (slight non significant increase). Previous studies on verbal cues also show improvement in step length, stride length and speed but shows reduction in cadence. However, study by Weiner and coworkers showed that out of three subjects in stride length instruction group, one subject showed no change in cadence and two subjects showed progressive increase in cadence.

Michael H Thaut study shown that auditory rhythm has a profound effect on the motor system. Evidence shows that the auditory and motor system has a rich connectivity across a variety of cortical, sub cortical, and spinal levels. The auditory system—a fast and precise processor or temporal information—projects into motor structures in the brain, creating entrainment between the rhythmic signal and the motor response. Based on these physiological connections, a large number of clinical studies have researched the effectiveness of rhythm and music to produce functional change in motor therapy for Parkinson's disease. Comparative studies also have shown auditory cue training to be more effective than other sensory cues and other techniques in physical rehabilitation

The present study also showed that there were significant improvement in group B with't' values for Step length and mobility were 7.6540 and 19.78 respectively.

Hence, the current study showed that there was statistically significant improvement in group B than compared to group A.

VI. CONCLUSION

The study aims at exploring the effectiveness of visual and verbal cue training along with tactile stimuli on gait and mobility among Parkinson's patients. In this study for group A, we used visual cue training and tactile stimuli on gait and mobility, for group B verbal cue training and tactile stimuli on gait and mobility.

The statistical analysis was done using paired't' test, used to find out the significant effect of visual and verbal cue training along with tactile stimuli on gait and mobility between pre test and post test. Unpaired't' test is used to find out the significant difference in step length and mobility group A and group B. Results obtained can be summarized that verbal cue training and tactile stimuli on gait and mobility among Parkinson's patients had significant improvement in both mobility and step length. It was shown that both group A and group B had significant effectiveness on mobility and step length in Parkinson's disease though group B shown better improvement in both mobility and step length so verbal cue training along with tactile stimuli on gait and mobility among Parkinson's patients.

6.1. LIMITATIONS:

1. Numbers of subjects were small.
2. All measurements were taken manually and this may introduce human error which could threat the studies reliability.
3. This study was limited to mobility and step length alone.
4. Cognitive problems were not taken in to consideration.
5. Researcher did not have control over the patient during their activities at hospital other than what is prescribed to be.

6.2. RECOMMENDATIONS:

1. To establish the efficacy of treatment, sample study can be made bigger than this.
2. Longer duration study can be done to find visual and verbal cue training along with tactile stimuli on gait training.
3. Further studies can be conducted on other areas affected by Parkinson's disease.
4. Further studies can be conducted visual and verbal cue training along with tactile stimuli on gait training in Parkinson's by using various outcome measures.

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ANNEXURE -1

ASSESSMENT

Name:

Age:

Sex:

Occupation:

IP No:

Dr referred by:

Address:

Chief complaints:

History collection:

Past medical history:

Present medical history:

Personal history:

Familial history:

Associated problems:

Vital signs:

BP:

Temperature:

Respiratory Rate:

Heart Rate:

OBJECTIVE ASSESSMENT:

On Observation:

Built:

Posture:

Attitude of limbs:

External appliance:

Deformities:

External wounds:

Tropical changes:

On palpation:

Muscle tone:

Tenderness:

Warmth:

On examination:

Higher center examination:

Level of consciousness:

Orientation:

Vision:

Memory:

Hearing:

Cranial nerve examination:

SENSORY ASSESSMENT:

Superficial:

Deep:

Cortical:

MOTOR ASSESSMENT:

Tone:

Reflexes:

Superficial:

Deep:

Voluntary control:

Range of motion:

CO-ORDINATION:

BALANCE:

Static equilibrium:

Dynamic Equilibrium:

GAIT ASSESSMENT:

Cadence:

Step length:

Stride length:

Base width:

Walking pattern:

Mobility

Mobility was assessed by “TIMED UP AND GO TEST”

BLADDER/ BOWEL EXAMINATION:

RESPIRATORY TRACT ASSESSMENT:

RR:

Rhythm:

Pattern:

Chest expansion:

ACTIVITIES OF DAILY LIVING:

INVESTIGATION:

SPECIAL TEST:

TREATMENT:

Medical management:

Physiotherapy

ANNEXURE -II

FOLLOW UP CHART:

Name: **Weight:**

Age: **Height:**

Sex: **Date of admission:**

Occupation: **Date of Discharge:**

I.P.No:

Parameter	**Pretest Score**	**Post test score**		
		1st week	**2nd week**	**3rd week**
Step length Time up and go test				

ANNEXURE – III

PATIENT CONSENT FORM

I ----------voluntarily consent to participate in the research named

A STUDY OF COMPARATIVE ANALYSIS OF VISUAL AND VERBAL CUE TRAINING ALONG WITH TACTILE STIMULI ON GAIT AND MOBILITY AMONG PARKINSON'S PATIENTS

The researcher has explained me the treatment approach in brief risk of participation and has answered the questions related to the study to my satisfaction.

Signature of the participants:

Signature of the witness :

Signature of the researcher :

Date:

Place:

ANNEXURE – IV

SCORES OF GAIT

Step Length for Group A and Group B

Table

Group A		**Group B**	
Pre test	Post test	Pretest	Post test
10.4	14.2	11.5	16.1
11.5	15.5	10.5	15.3
12.3	14.1	13.1	17.2
15.	17.2	11.6	17
13.1	16.3	10.9	15.1

SCORES OF MOBILITY

Timed Up and Go Test for Group A and Group B

Table

Group A		**Group B**	
Pre test	Post test	Pretest	Post test
18	15	17	14
16	14	19	13
19	16	16	11
17	14	19	12
18	15	17	12